

DECISION DOCUMENT

February 28, 2000

## PHASE II and PHASE III BOND RELEASE

J.B. King Mine

ACT/015/002-99BR

EXECUTIVE SUMMARY

Based on bond release findings in this document for Phase II and Phase III bond release, the Division finds that Western States Minerals Corporation has met the minimum regulatory requirements for approval of the Phase II bond release for the J.B. King Mine. Simultaneous Phase II and Phase III release is the intent of this bond release Decision Document.

Phase II bond release is conditionally approved. Prior to final Phase II release, WSMC must 1) remove the north perimeter ditch and revegetate and mulch to approval on the ground by the division, 2) remove the miscellaneous scrap metal on site, 3) remove silt fences on site, 4) remove the perimeter fence, and 5) remove the sign. WSMC must contact the Division inspector to be present on site and approve the work on the ground. When Phase II conditions are satisfied, Phase III bond release will be granted simultaneously with Phase II bond release.

Findings made in this decision document relate to the following requirements: administrative, vegetation, erosional stability, hydrologic, engineering stability, subsidence, and roads.

HISTORY AND BACKGROUND of the J.B. KING MINE PERMIT

The J.B. King Mine operated intermittently since 1930 and was known earlier as the Dog Valley Mine. Essentially all of the surface area was disturbed prior to the establishment of the Utah Mined Land Reclamation Act in 1975, and also prior to Western States Minerals Corporation's purchase of the mine site in 1976. The mine was subsequently named "J.B. King" in honor of an officer of WSMC whose life was lost in a plane crash. The mine ceased underground mining operations in May 1981. The portals were permanently sealed, and the facilities and equipment were removed for salvage during the spring and summer of 1985.

The reclamation permit was issued on August 13, 1985 and a bond in the amount of \$262,577 was posted. Reclamation began in August, September and October 1985. The first phase of the reclamation consisted of removing six inches to four feet of contaminated surface material from the yard, coal stockpile area, and from the slurry/sedimentation ponds. This material was placed around the toe of the existing coarse refuse area.

Cement pads and foundations for the shop and mill were broken up and used as part of the portal backfill. Non-organic trash and debris were buried in a designated landfill at the southeast end of the mine site. All of the mine wells were plugged according to state requirements except Water Well #1 which was left intact at the request of the landowner, Utah State Lands and Forestry, now State Institutional Trust Lands Administration (SITLA).

The second phase of reclamation consisted of grading the refuse area to a rolling topography with a maximum slope of 4H/1V. This area was then dry compacted with a drum roller mounted on a D-6 dozer. The seven mine portals were backfilled by dozing two foot lifts of material from the portal bench area into and against the portals. Each lift was compacted prior to the placement of the next lift.

The third phase of reclamation consisted of the excavation, haulage and placement of four feet of topsoil and substitute topsoil on the regraded refuse pile and the coal stockpile pad. The topsoil stockpile and the existing sediment control berm were utilized to supply a small portion of the required soil material. The majority of the soil material was borrowed from what is now the main diversion channel which extends from the portal area in the southeast corner of the site to the northwest corner of the mine site. Concurrently with this work, a new sediment pond, sized to contain the 10-year 24-hour storm event was constructed at the northwest end of the mine site. A D-9 and D-8 dozer, three large scrapers, and a water truck were utilized during this phase of the project. This work concluded in 1986.

Phase I bond release was granted on November 10, 1986. An amount of \$136,499, or 60% of the bond amount, was released to the permittee.

The main diversion channel and the feeder ditch were originally designed to be unarmored with gently sloping revegetated banks. This design, however, did not properly take into account the intensity of the rainfall events nor the relatively low vegetative cover common to this region. Several large precipitation events resulted in excessive erosion of the feeder channel and the upper reaches of the main channel.

In May 1987, rip rap was installed in the eroded channel areas. Unfortunately, the contractor did not install the rip rap correctly which resulted in continued erosion problems. In June 1988, the channels were recontoured and the rip rap was re-installed. The check dams in the feeder ditch were also re-installed. These reconstructed channels, unfortunately, were not intact and did not function and were reconstructed a third time in 1994.

A second area of erosion concern had been the west and southwest facing slopes of the reclaimed coal refuse area. Contour furrows were constructed along this slope during reclamation. It was believed that these furrows in combination with straw bales and silt fences

would control erosion until vegetation had been established. In the late summer of 1986, the contour furrows were filled with sediment and breached after the occurrence of several major precipitation events. This resulted in rilling along most of the slope area. The rilling, however, continued and the application of silt fencing and rock-anchored straw in the large rills did not control the rilling. As with the channels, the refuse pile was redone in 1994.

The west and southwest facing slopes of the reclaimed refuse area were the most difficult areas of the site to revegetate. This was due to a combination of the southern exposure, unauthorized cattle grazing, and low precipitation from 1988-1990. In 1989, the perimeter fence was completely rebuilt and a road was relocated outside of the reclaimed area in order to limit cattle trespass. It was believed that hand seeding of the rill areas during the fall plus increased precipitation would gradually increase the vegetative cover in this area and, it did.

Some of the areas which were traversed by heavy equipment during the channel reconstruction also had relatively low vegetative cover. These areas which comprise approximately two acres were ripped, reseeded and mulched in mid-October 1989. These areas were also revegetated again in 1994.

In May 1983, an area of subsidence was discovered above the 2<sup>nd</sup> East Panel, the only area of the mine which was completely pillared out. Additional subsidence has not occurred since 1983 as evidenced by the annual subsidence surveys. A series of tension cracks existed along the perimeter of the subsided area. These cracks measured 6 to 12 inches in width and several hundred feet in length.

Remedial work to close the cracks was first conducted in 1984 and consisted of jamming small timbers into the cracks and backfilling with soil. Additional soil backfill was added in April 1986. The area remained stable from that time until July 1988 when a 5 plus magnitude earthquake occurred in the immediate area. This resulted in the redistribution of stresses and the reopening of the tension cracks. Subsidence surveys were discontinued in 1997 due to the fact that no movement was noted from 1988 to 1997.

In order to eliminate the possibility of the future reappearance of the cracks, it was decided to excavate down to bedrock and then backfill the cracks with a fine grained sand. This was performed in the fall of 1988, and again in the spring of 1990 after additional settlement was noted. Some additional settlement was expected. This was filled in with foam and sand as needed.

WSMC received an Earth Day Award from the Board of Oil, Gas, and Mining in 1998 for "Outstanding results following application of innovative environmental technology", i.e. the use of biosolids and the importation and application of additional rock to existing soils for

reclamation; and water harvesting techniques.

Two papers were written about the refuse at the J.B. King Mine: 1) Leatherwood, J. and Kunzler, L. 1989. *Coal Refuse Weathering Under Cold Desert Conditions*, Utah Geologic Association, Publication 17, p.159-164., and 2) Kunzler, L. and Leatherwood J. 1990. *Acid Generation and Vegetation Response of Reclaimed Coal Refuse in Utah*, Reclamation Research Publication #9003, p.274-283.

A study was conducted to evaluate several methods of establishing cryptobiotic crusts during reclamation on drastically disturbed soils. Participants in the study were Western States Minerals, the Division, and the National Park Service. The study was conducted from June 1996 through August 1998. The plots are still in tact if additional data is desired. Treatments included inoculation with native cryptobiotic soils, elemental sulfur, and granular sugar. The experiment was applied in a randomized block factorial design. Surface soil samples were taken June 1998 for analysis at the National Park Service laboratory in Moab. Initial results indicate that any treatment or combination of treatments that included sulfur had the highest chlorophyll content. Chlorophyll is an indicator of blue-green algae, an early component of cryptobiotic crusts. The National Park Service committed to publish the results in a regional journal.

### **CHRONOLOGY FOR PHASE II AND PHASE III BOND RELEASE**

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|-------------------------------------|---|
| June 3, 1999                        | WSMC submits Phase II and Phase III bond release application.   |
| July 6, 1999                        | Division accepts application for Phase II bond release, but not Phase III because there is no vegetation information for Phase III. |
| July 6, 1999                        | Soil sample results of the RUSLE "K" suite from Intermountain Labs as a result of the May 27, 1999 technical site visit.            |
| July 27, 1999                       | Susan White observes Phase III vegetation sampling by Sam Bamberg and Ingrid Hanne at J.B. King Mine. Sampling was representative.  |
| September 7, 14,<br>21 and 28, 1999 | Phase II and Phase III bond release published in the <u>Emery County Progress</u> .   |
| September 13, 1999                  | Fax from WSMC to Pamela Grubaugh-Littig about commitment by WSMC for future maintenance at sediment pond (letter dated              |

August 17, 1994 from WSMC and September 14, 1994 from SITLA.)

September 22, 1999 WSMC submits copies of letters to agencies about Phase II and Phase III bond release.

September 28, 1999 Division sends Phase II bond release review. WSMC submits Phase III bond release 1999 vegetation monitoring survey.

October 14, 1999 WSMC responds to Phase II bond release review.

October 22, 1999 SITLA letters concurs with leaving the sediment impoundment in place. SITLA also requests removal of the fence.

October 28, 1999 End of public comment period. No comments received.

November 10, 1999 Water Sample taken from pond and sent to Mountain States Analytical, Inc.

November 12, 1999 Approval to Remove North Perimeter Ditch and silt fences by DOGM.

November 17, 1999 Letters of invitation from DOGM to WSMC, SITLA and OSM for December 1, 1999 bond release inspection.

December 1, 1999 Phase II and Phase III bond release inspection. In attendance:

Al Cerny, Western States Mineral Corporation  
Jim Ashton, Western States Mineral Corporation  
Buzz Gerick, Western States Mineral Corporation  
Pamela Grubaugh-Littig, DOGM  
Susan White, DOGM  
Wayne Western, DOGM  
Sharon Falvey, DOGM  
Mary Ann Wright, DOGM

December 3, 1999 Selenium analyzed from November 10, 1999 pond sample.

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- December 23, 1999 Amendment submitted to remove the permit commitment for a vegetation production standard at Phase III bond release, ACT/015/002-AM99C
- January 10, 2000 Water analysis submitted to the Division for "selenium" analysis in November 10, 1999 pond sample.
- January 25, 2000 Amendment AM99C approved.
- February 23, 2000 Letter to SITLA advising them of their obligations with the Water Rights after bond release.
- February 25, 2000 WSMC advised of recommendation for Phase II and Phase III bond release.

## **ANALYSIS AND FINDINGS FOR PHASE II BOND RELEASE**

### **Administrative Analysis for Phase II Bond Release**

Regulatory Reference: R645-301-880 - 880.330

The application for Phase II and Phase III bond release for the J.B. King Mine was made on June 3, 1999 and the Division accepted application for Phase II only by letter dated July 6, 1999. Phase III bond release was not accepted because there was no vegetation information in the June 3, 1999 submittal. However, the vegetation was sampled on July 27, 1999 and data was submitted on September 28, 1999. Phase II and III notification were published in the Emery County Progress on September 7, 14, 21, and 28, 1999. The comment period ended and there were no comments.

Letters were sent to the landowners ( SITLA and BLM) by WSMC advising them of this bond release action. Others on the mailing list included: Emery County Planning, OSM, BLM - Price Field Office, Water Rights, DWR, Price Water Improvement District, Emery Water Conservancy District, Southeastern Utah Association of Governments, and Department of Environmental Quality. Invitations to the bond release inspection on December 1, 1999 were sent by the Division on November 17, 1999.

In attendance at the December 1, 1999 bond release inspection were:

Division:	Bob Davidson, Wayne Western, Susan White, Sharon Falvey, Mary Ann Wright, and Pamela Grubaugh-Littig.
Western States	
Minerals Corporation:	Al Cerny, Buzz Gerick, and Jim Ashton
Emery County Planning:	Val Payne

The entire reclaimed area was observed during this inspection. At the start of the inspection, it was noted that the gate was down the day before and had been put back up by WSMC. A salt lick was inside the fence and fresh cow manure was present on the site. Buzz Gerick called Pamela Grubaugh-Littig on November 30, 1999 about this situation and she communicated this situation to Tom Faddies at SITLA. A letter was sent in December 1999, to the suspected grazer explaining the importance of keeping cattle off the site.

The reclaimed channels that had been constructed three times were (and are) working. The portals that had been sealed 14 years ago are not easily visible but the general location was pointed out. The vegetation test plots that were reclaimed in 1994 were also observed. This area has ample vegetation. The coal refuse pile that had biosolids and rock mulch added were also

viewed. The reclaimed pile has nice micro environments with a good stand of vegetation, considering the eight inches of annual precipitation. Small pockets of coal mine waste were exposed in places where rills and gullies formed. Old mine sites, like the J.B. King Mine, generally contain several pockets of coal mine waste, but such exposure of coal is tantamount to background coal outcrop exposure and thus the Division views this as posing little or no hazard to humans or wildlife. The amount of dirt mixed with the coal makes the concern for coal waste fires almost nil.

The grouted ditch and north perimeter ditch were also walked by the group. The north perimeter ditch will be removed as well as the silt fence. The sedimentation pond was holding water (with ice on the top) and had fresh cow tracks around it. This pond will be retained for livestock watering, as approved by SITLA, the landowner.

Minor amounts of noncoal waste were seen at the site, such as small pieces of scrap metal. The permittee committed to remove these before the bond is released. The weather station also needed to be removed from the site that was still on-site the day of the bond release inspection. (This weather station was subsequently removed by WSMC on December 1, 1999 after the inspection.)

The attendees drove to the area above the mine where subsidence cracks had been observed above where coal pillars had been pulled. The cracks were four to six inches wide and one foot to three feet deep and up to six feet long. In the past, the permittee had sealed old cracks with timbers, soil and foam. The new cracks were most likely formed by small animals burrowing into the cracks followed by soil piping or flowing into voids. The hazard is not significant as far as a safety hazards and is similar to naturally-occurring hazards in the area.

No problems were identified during this bond release inspection. See attached memo, *Technical Site Visit for J.B. King Mine*, dated December 1, 1999.

#### **Administrative Findings for Phase II Bond Release:**

Western States Minerals Corporation has met the minimum requirements for Phase II bond release for the J.B. King Mine. See 1) application for Phase II Bond Release, 2) notification letters to landowners concerning the bond release, 3) publication of Phase II Bond release for four consecutive weeks with no resulting public comments, and 4) Phase II Bond Release inspection report.

#### **Vegetation Analysis for Phase II Bond Release**

Regulatory Reference: 30 CFR Sec. 785.18, 817.111, 817.113, 817.114, 817.116; R645-301-244, -301-353, -301-354, -301-355, -301-356, -302-280, -302-281, -302-282, -302-283, -302-284.



**Analysis:**

**Standards for Success.**

The regulatory requirements for Phase II bond release are described in R645-301-880.320. The requirement for the vegetation portion of Phase II release is successful vegetation establishment. The Division has considered, on previous Phase II bond releases, vegetation to be successfully established if it meets the regulatory and permit requirements for vegetative cover and vegetation is adequate to reduce erosion similar to off site levels. The cover requirements for the J. B. King Mine in this instance are that the reclaimed site needs to meet 90 percent of the reference area cover at 90 percent statistical confidence.

**Cover**

The Bond Release application presented information from vegetation sampling in June 1998 performed by Bamberg Associates. Vegetative cover and shrub densities were sampled using techniques described in the Division's Vegetation Information Guidelines. Vegetation cover was surveyed using an ocular sampling method. A 4m<sup>2</sup> quadrant was used on the disturbed area and a 1m<sup>2</sup> quadrant used in the reference area. A completely random sampling design was used by establishing a grid system on site.

The average vegetative cover on the reclaimed area as sampled by Bamberg was 18.4 percent. This cover value represents total desirable cover; annual weeds were excluded from the total. A total of 40 samples were taken (n=40). The minimum required sample size (n(min)) was calculated according to the Division's Vegetation Information Guidelines. Twenty-two samples were required to meet sample adequacy. The median (or middle value) was 17.0 percent vegetative cover.

The reference area is a shadscale-grass community and approved by the Division as a reference site in 1985. Total average vegetative cover of the reference site in June 1998 was 13.1 percent. A total of 20 samples were taken (n=20). The n(min) required to meet sample adequacy was calculated at 6 samples. The median cover was 13.0 percent.

No statistics were required to demonstrate that the reclaimed site exceeds the reference area standard in the Bamberg study since 17% cover in the reclaimed area is greater than 13% in the reference area.

The Division has traditionally performed its own vegetation sampling at the time of Phase II Bond Release. The reclaimed and reference area were sampled in early July 1998. The sampling methodologies were similar to Bamberg except that a stratified random sampling

design was used. Total desirable plant cover on the reclaimed site had an average 17.2 percent cover (n=50). The n(min) required to meet sample adequacy was calculated at 141 samples. The median vegetative cover was 10.0 percent. Total desirable plant cover on the reference area measured 20.5 percent cover. The sample size was 20 (n=20) and the n(min) was 23. The median vegetative cover was 10.0 percent.

A comparison of means and medians for the Division sampling show no statistically significant difference between the means of the reclaimed and reference areas at the 90 percent confidence level. The Division did not meet or try to meet the calculated minimum sample size on the reclaimed area.

The results of the field sampling are summarized in the table below.

Division: July 9, 1998				Bamberg Associates June 25-27, 1998	
	Reclaimed	Reference	90 % of Reference	Reclaimed	Reference
Mean % Cover	17.2	20.45	18.4	18.4	13.1
Confidence Interval	13.5 to 20.9	17.47 to 23.43	15.7 to 21.1	16.5 to 20.1	12.2 to 14.0
Median	10.0	20.5	18.45	17.0	13.0
Standard Deviation	15.7	7.7	7.0	6.7	2.4
Variance	246.0	59.7	48.4	44.7	5.7
Minimum Value	0.0	9.0		8.0	9.0
maximum value	75.0	38.0		32.0	18.0
n	50	20	20	40	20
n(min)	141	23		22	6

Vegetation cover on the reclaimed area measured by Bamberg Associates and the Division had similar average (mean) values but dissimilar median and variance values. This is explained by the wide range of cover values sampled by the Division (0 to 75 percent cover) verses the narrow range sampled by Bamberg Associates (8 to 32 percent cover). When asked, Bamberg Associates stated that no values or quadrats were excluded from the sample because of no, low, or high cover values. The discrepancy in the large variance of the Division's data and low variance in Bamberg's data is of concern to the Division. Because of this concern the Division conducted another study in September 1998 and found a range of cover values (0 to 80) and variance (266) similar to the Division's July study.

The Division's requirement for sample size to meet a minimum calculated sample size provides protection against releasing the bond when the bond should not be released (statistically known as a Type II Error). A large range of sample values results in a large variance from the mean creating values with a large confidence interval. Large confidence intervals in the data will almost always insure the standard can be met. Sampling until the requirements for a minimum calculated sample size is met either:

- reduces the variance or
- ensures that enough samples have been taken to represent the true mean.

Bamberg Associates' and the Division's data indicate that vegetation establishment (cover) requirements for Phase II bond release are met. The vegetation of the reclaimed area is not significantly different than the reference area. In the case of the Bamberg study no statistical tests are required since the reclaimed area has greater vegetation cover than the reference area.

### **Vegetation Findings for Phase II Bond Release**

Information provided in the bond release application meets the minimum regulatory and permit requirements for Phase II bond release.

### **Erosion Analysis for Phase II Bond Release**

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

#### **Background:**

Erosion has been an on-going issue at the J. B. King mine site since reclamation. Most attempts at eliminating the accelerated erosion, through contour furrowing, placement of silt fencing, smoothing, stuffing with straw or rock, and reseeding, were unsuccessful. Vegetation cover of 20 percent can reduce erosion to comparable off site levels, but will not eliminate erosion.

In 1994, a rock mulch, along with biosolids, and the application of surface roughening treatment was used in efforts to reduce erosion and coal refuse exposure on the refuse pile. This effort has reduced the erosion, although, some is still apparent on the refuse pile. Completely recontouring the site to allow for base controls, complex slope shapes, continuation of off site drainage through the site, and top soiling with low erosive materials could possibly stabilize the site to background levels. Completely recontouring the site, however, is an unrealistic expectation nearly 15 years after Phase I bond release.

**Analysis:**

State regulations R645-301-880.320 gives the requirements for Phase II bond release. Either of the following soils related requirements must be satisfied prior to Phase II bond release:

- **Evaluation of Erosional Soil Stabilization.** Show suspended solids or runoff outside the permit area is not in excess of the requirements set by UCA 40-10-17(j) and by R645-301-751, for which the applicable parts of UCA 40-10-17(j) state:
  - (j) Minimize the disturbances to the prevailing hydrologic balance at the mine site and associated offsite areas and to the quality and quantity of water in surface and groundwater systems both during and after surface coal mining operations by:*
    - (i) Avoiding acid or toxic mine drainage by such measures as, but not limited to:*
      - p4(A) Preventing or removing water from contact with toxic-producing deposits;*
- **Evaluation of Soil Productivity for Prime Farmlands.** Show soil productivity for Prime Farmlands has been returned to equivalent levels as farmed land in the surrounding area according to the requirements set by UCA 40-10-11(4) and by R645-301-200.

**Acid and Toxic Drainage - UCA 40-10-17(j)**

**1994 Sampling Amendment**

During May 1994, a drilling and sampling program was conducted at the JB King mine for the following three reasons:

- Geotechnical testing to determine acceptable side slope materials for the reclamation channels.
- Determine the toxic and/or acid forming characteristics of the channel material into which the proposed reconstructed channels could potentially erode.

- Determine the toxic and/or acid forming characteristics of any on-site refuse material.

The resulting July 1995 permit amendment (incorporated Oct. 5, 1995) provides analyses results for both the channel and refuse materials at the site. The amendment states the site will not produce acid and toxic forming material after mixing with non-toxic fills through erosion processes. Adjacent offsite areas were also sampled and were shown to be generally similar to the onsite samples, except they were non-acid forming. Sampling and conclusions were based in part on the State of Utah guidelines for topsoil and overburden management for underground and surface coal mining.<sup>1</sup> The amendment showed the following:

- The channel and native soil materials contained toxic levels of boron and selenium.
- The refuse pile materials contained toxic levels of boron and selenium, and the refuse was shown to be acid forming.

However, the 1995 amendment contained errors with respect to reporting selenium and boron analyses. Both boron and selenium were reported as soluble, but were in fact analyzed as total. Therefore, additional boron and selenium testing was done in October 1994 using sample splits from the May 1994 samples. The resulting Hansen, Allen and Luce 1994 report to Western States Minerals is summarized as follows:

- Channel and native soil materials contained **non-toxic** levels of boron and selenium
- The refuse pile materials contained toxic levels of selenium.

Initial reclamation at the J. B. King Mine was conducted in 1985-86. The resulting convex land-form surface predisposes the soil surface to erosion. Currently, no refuse, however, is exposed at the refuse pile. However, rill and gully erosion has occurred in the general area located south of the refuse pile and north of the main drainage channels. In this east-central site area, off-site drainage flowing across the reclaimed surface has resulted in considerable rill and gully formation, often exposing buried coal refuse material (Figures 1 thru 3); this exposed coal refuse is not associated with the refuse pile. Coal waste is also exposed at the lower end, north east eroding bank of the main, right fork drainage channel (Figure 4). This east-central site area is identified as AREA 3, Figure 2, JB King Mine site Layout Transect and Area of Influence Map, Soil Loss Evaluation of the Reclaimed JB King Mine, May 1999, WSMC Engineering, Reno, Nevada.

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<sup>1</sup>Leatherwood, J., and Duce, D., 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining.

UCA 40-10-17(j), (i), p4(A) specifies that reclamation must prevent or remove water from contact with toxic-producing deposits. As evidenced by the exposed coal refuse materials in the rills, gullies, and channel, water has been in contact with possible toxic-producing deposits. According to the October 5, 1995 incorporated amendment, harmful effects of toxic and acid forming materials should be nullified through the erosion process by mixing with other non-toxic/non-acid forming materials. The sedimentation pond captures the sediment and runoff. Over the life of reclamation, neither the Division nor Western States Minerals has ever observed or recorded any discharge from the sedimentation pond.

#### 1992 Sampling Records

During 1992, soil and refuse samples were collected from the J.B. King site and analyzed using the Nevada Meteoric Water Mobility Procedure. The purpose of these tests were to evaluate the potential for dissolution and mobility of certain constituents from mine rock samples by meteoric water. The procedure consists of a single-pass column leach over a 24 hour period using a mine rock sample to extraction fluid (effluent) ratio of 1:1. The extraction fluid is Type II reagent grade water which is essentially de-ionized or distilled water. Samples included one sample from the sediment pond, three samples of the soils at the west edge of the refuse pile, and three samples from the top of the refuse pile, which included the exposed coal on the vegetation test plots.

The report concludes that the coal refuse material appears not to present any apparent potential for degradation of the surrounding environment due to leaching of metals. Analyses of the leach liquor for Secondary Drinking Water parameters showed the following:

- Coal refuse and spoil materials are able to leach higher concentrations of TDS and sulfate than the surrounding soils. Analyses of the sediment retention pond materials show that these sediments have the lowest reported concentrations of TDS and sulfates.
- Sodium Adsorption Ratio values for all samples were in the acceptable range.
- The coal refuse and spoil materials did indicate the potential to be acid generating in two of the three samples analyzed. However, soils in the area have the capacity to neutralize any acidic runoff which may result from the coal refuse. Analyses of the sediment retention pond materials show that these sediments are non acid generating.
- The coal refuse materials when exposed to an open flame combined with sufficient oxygen will ignite. Based on the high composition of non-coal materials (~91 %), sustained combustion of the refuse pile is not likely and not considered a problem.

**Erosional Stability (Soil Stabilization) - R645-301-244**

*Erosion Monitoring Program*

The Phase II bond release application provides summary information for the "Erosion Monitoring Program". As specified in the approved Mine Reclamation Plan, the "Erosion Monitoring Program" was set up for the reclaimed JB King Mine in 1995 to monitor erosion for Bond release purposes (i.e., section UMC 817.110). Periodic monitoring has previously been submitted to the Division documenting erosion data, which includes photos and cross-sections. The monitoring data shows the geomorphic changes that have occurred over time at the site. The following observations have been submitted summarizing the geomorphic changes:

- Approximately 2/3 of the surface water that is handled at the reclaimed site (32.4 acres) is from off-site drainage (61.9 acres).
- Approximately 88% of the off-site drainage water is conveyed on-site by Ditch #1 (61%) and Ditch #2 (27%).
- The remaining 12% of the off-site drainage water flows onto the site has contributed to minor formation of rills and gullies over a broad area of the reclaimed site.

*Soil Loss Evaluation - RUSLE*

Western States Minerals presents a "Soil Loss Evaluation of the Reclaimed J.B. King Mine" report dated May 1999, which discusses erosive activity at the JB King Mine site as determined using the Revised Universal Soil Loss Equation (RUSLE). The soil erosional ability factor, "K" value, is a numeric representation of the ability of the soil to resist erosion. Soils increase in erosional ability as "K" becomes larger. "K" is independent of slope and dependent only on particle size and distribution, soil structure, and permeability. The "Soil Loss Evaluation" report includes (1) a prediction of the current rate of soil loss at the site, and (2) a comparison of the RUSLE prediction versus an estimate based on the sediment amounts collected in the sediment pond. As reported by Western States, the RUSLE prediction for soil loss at the reclaimed site is 1.27 tons/acre/year; average soil loss based on the sediment pond is 1.48 tons/acre/year.

RUSLE is an accepted model for determining the average annual soil erosion rates exclusive of rill, gully and channel erosion rates. The J.B. King reclaimed site was divided into six evaluation areas with each area given a representative transect based on internal similarities of soil type, vegetative cover, rock fragment composition, and topography. The "Soil Loss

Evaluation" report uses previous data from 1993 that represents each of the six transects. The six transect areas were selected, in part, to correspond to the soil samples collected. An attached Soil Location Map identifies each of the six transect areas and their corresponding soil sample location points. Western States Minerals states that samples JBK03 and 04 were collected off-site, but were determined to correlate with Areas #4 and #5, respectively, and were therefore, used to represent those areas. Soil samples collected off-site, from undisturbed soils, do not represent either the physical or chemical status of on-site, drastically disturbed soils and fills used for reclamation. Furthermore, Western States Minerals states that data values were adjusted for changes that have occurred over time to account for sample collection methodology. However, the two modifications that were made are only applicable for Area 2:

1. A slight increase in the percent organics, based on the addition of biosolids and revegetation success from 1993 to present.
2. The percent silt and clay were decreased slightly to account for the greater proportion of rock fragments, but were not initially sampled in 1993.

These two modifications are not applicable for Areas 1, 3, 4, and 5.

Elements of the RUSLE equation (e.g., K factor) require specific soil physical parameters for determining relevant values that represent site specific soils. These soil parameters include, but are not limited to, soil permeability, soil structure, % very fine sand, coarse fragment % by weight, % rock cover, and soil density. The 1993 soil data does not report % very fine sand, soil permeability, soil density, % rock by weight, or % surface rock cover. Additional transect specific data should include % canopy cover and soil root mass that were not sampled in 1993. Since none of these parameters were included in the 1993 soil data, they were entered subjectively into the RUSLE program based on the judgement of Western States Minerals. Using non-specific and incomplete data, or averaging across the site for missing data, does not accurately reflect or represent each region; therefore, the resulting RUSLE results can not be validated and are at best, only approximations for soil stabilization.

As an independent investigation, the Division, on May 27, 1999, performed its own "K" factor analysis using three samples, but which was not statistically valid but nonetheless revealing. Two samples were taken from the reclaimed refuse pile and a third from the reclaimed area by the weather station. Two dominant soils at the site are sandstone based soils and Mancos shale based soils. The values which were calculated for the soils used in reclamation had lab test values between the published values for Mancos and sandstone based soils.<sup>2</sup>

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<sup>2</sup>Memo to Internal File on "K" Factor Analysis, Western States Minerals, J.B. King Mine, ACT/015/002, from Sharon Falvey and Bob Davidson, dated 2/23/00.



**Prime Farmlands Evaluation - UCA 40-10-11(4)**

No prime farmlands exist on site; therefore, UCA 40-10-11(4) does not apply.

**Erosional Stability Findings for Phase II Bond Release:**

Information provided in the application is considered adequate to meet the requirements of this section of the regulations. The J.B. King reclaimed mine site should receive Phase II bond release based on:

- The minor rill and gullies should not disrupt the approved post mining land use or interfere with further vegetation establishment.
- The eroded sediments containing in part coal and refuse are shown not to be toxic or acid forming when diluted with other on-site sediments.
- Soil loss evaluation of the reclaimed site using RUSLE provides a best guess approximation that soils in place as a result of reclamation, are stable. A non-statistical study by the Division indicates soils approximate background Mancos shale and sandstone based soils in erosional stability.

**Hydrologic Analysis for Phase II Bond Release**

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-880.320.

**Analysis:**

**Sedimentation Pond**

The following R645-301 regulations apply to permanent sedimentation ponds:

- 1) **733.220.** A permanent impoundment of water may be created, if authorized by the Division in the approved permit based upon the following demonstration:

Approval to retain the pond was previously granted. There were references to some of the regulatory requirements in the 1995 reclamation plan; however, all requirements were not clearly addressed and this resulted in deficiencies outlined in the September Technical Analysis (TA). The following sections summarize WSMC's response and are followed by the Division's analysis:

- 2) **733.221.** The size and configuration of such impoundment will be adequate for its intended purposes;

The pond has 4H:1V slopes around the perimeter to allow for wildlife and livestock access. The capacity was stated by the applicant to be sufficient to handle "a large herd of cattle" (letter from WSMC to Pamela Grubaugh-Littig dated October 14, 1999, page 5).

The Division considers the pond configuration adequate for the intended purpose: 4H:1V slopes do provide access for livestock and wildlife. Although the capacity was stated to be sufficient to handle a large herd of cattle, no numbers were provided describing what the animal water consumption requirements are, or how many cattle or wildlife are expected to utilize the area at one time.

The Division considers the size adequate for the intended use for the following reasons: 1) rainfall occurs infrequently and, 2) the pond has not been known to discharge. Therefore, it can be determined that the pond holds the maximum available water following a precipitation event. This determination is based on documentation in inspection reports.

- 3) **733.222.** The quality of impounded water will be suitable on a permanent basis for its intended use and, after reclamation, will meet applicable Utah and federal water quality standards, and discharges from the impoundment will meet applicable effluent limitations and will not degrade the quality of receiving water below applicable Utah and federal water quality standards;

The letter submitted by WSMC suggests information submitted in a memorandum, dated Sept.10, 1992, demonstrates the long term water quality expected at the pond.

The information provided in the 1992 analysis assesses fill and refuse properties at the site using the Meteoric Water Mobility Procedure. The method uses a single pass column leach process, using de-ionized water over a 24 hour period. (Note: the procedure may not be suitable for obtaining extracts from finely divided soils such as clayey soil, sludge, and mill tailings). This method characterizes fill, but does not necessarily characterize water quality. Since water is not known to discharge from the pond and the site is located where evaporation rates are high, a potential for increased TDS, Alkalinity, pH, salts, boron and selenium is created for the pond water.

The Division could not make a finding based on the information provided by the applicant. Therefore, a water sample was collected by the Division on November 10, 1999 when the water elevation was low. Water was previously observed in the pond during an August 26,

1999 inspection. The sample results are compared with the state water quality criteria and livestock water quality criteria in Appendix A. These data show the water quality sample meets state standards.

The sedimentation pond captures a majority of the sediment from the site and is not known to have discharged during the reclamation period of 15 years. In addition, the nearest flowing drainage in this desert environment is 3 miles away at Ivie Creek, north of I-70. Therefore, the requirement that 1) discharges from the impoundment will meet applicable effluent limitations, 2) will not degrade the quality of receiving waters below, and 3) will meet applicable Utah and federal water quality standards, is considered to be met.

- 4) **733.223.** The water level will be sufficiently stable and be capable of supporting the intended use;

According to WSMC, the highest probability for capturing water in the pond is during late summer and early fall. This is supported by the data.

WSMC indicated the data supports the observations, but no data is referenced or provided; therefore, the Division summarized information documenting the pond water availability in Table 1. Information was gathered from inspection reports and quarterly impoundment inspections conducted from 1991 through 1999.

Based on the information presented in Table 1, the Division considers the pond adequate for the intended purpose: the pond provides a source of water for livestock and wildlife. Water is available intermittently during the period when livestock and large ungulates graze the area. Heavy use is from November through March. In a drought or low precipitation year, the pond may be dry. At other times during the winter months, the water may be frozen. In this arid region where few water sources are observed in the immediate vicinity, this impoundment will have periods where it fulfills the intended post-mining land use.

- 5) **880.320.** The applicant needs to provide for sound future maintenance by the operator or the landowner with the Division.

The surface facilities at this reclaimed site are on State Institutional Trust Lands holdings. SITLA is an independent agency of Utah state government and was established to manage lands that Congress granted to the state of Utah at statehood, 104 years ago. SITLA manages 3.5 million acres of land for mining, grazing, forestry, agricultural, business leasing and selling. SITLA has grazing and mining specialists who have been working there for over 20

years, managing the resources.<sup>3</sup>

This mine site currently has an active grazing lease which is not used but is held by the permittee, WSMC, in order to protect the site while in reclamation. When the mine is released from bond, and the grazing leases are up for renewal, WSMC has stated it will not renew the leases. It will be up to SITLA if they wish to issue another lease to a potential grazer.

An October 22, 1999, letter from Jim Cooper, Associate Director for Oil, Gas and Coal for SITLA, to Mary Ann Wright, Associate Director for Mining at OGM, indicated that "the impoundment is typical of many similar stock water ponds constructed by ranchers and landowners throughout Emery County and we do not believe long term maintenance is an issue." Additionally, discussion among Pamela Grubaugh-Littig, Coal Supervisor, Jim Cooper, and Mary Ann Wright on November 3, 1999, verified SITLA's satisfaction with the pond and the reclamation of the site in general. Mr. Cooper assured OGM that the letter he sent OGM stands for the SITLA position. He also assured OGM that SITLA manages millions of acres of lands in Utah, is in the business of land management, and has many stock watering ponds on its lands. He stated that SITLA thus knows how to adequately manage its lands and stock ponds. He further assured OGM that both SITLA's surface management staff, as well as mining staff, were fully cognizant of, and consulted in the letter to OGM.

The Division of Oil, Gas and Mining therefore finds that its sister state agency, SITLA, as one of the largest land owners and land managers in the state and being well staffed, are not only capable, but are also intent, upon conducting sound future management of their lands. This component of the regulatory requirement is satisfied.

#### **Diversions**

##### **Removal of all Temporary Sediment Control Measures and Diversions (R634-301-742.313.)**

The north perimeter ditch routed to the sedimentation pond, and a nearby silt fence needs to be removed. The ditch area needs to be regraded, roughened, and seeded before the bond can be released. This work must meet Division approval prior to final bond release.

WSMC indicated the ditch will be regraded, pocked and seeded. Once the applicant achieves regrading, this regulatory requirement can be considered complete.

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<sup>3</sup> *State of Utah School and Institutional Trust Lands Administration Fifth Annual Report, Fiscal Year 1999.*

Table 1. Pond Water Observations

Year	Water observations	Comment
1991	July 31 September 10 December 24	Some water noted- pond previously noted dry. First observation of water by this inspector. Estimated 2 feet of water in pond inspection.
1992	February 5 March 27 April 21 August 20 October 6 December 24	Water noted- pond dry in inspection report 1/22. Water noted 2 feet estimated depth. Water noted- some water; pond dry by 6/26. Water noted- pond dry in inspection report on 7/9/92. Water noted- 1 foot estimated depth in pond inspection. Water noted- 0.03 foot depth water noted in pond inspection.
1993		No water noted for year.
1994	August 3  October 15	Trace of water noted in pond inspection- noted dry in 6/9 and 9/22 inspection report. Water noted- pond dry in inspection report 11/15.
1995		No water noted for year.
1996	September 9 October 9 November 29 December 4	Water noted - pond full. Pond dry in inspection report 7/9. Water noted. Water noted - 2.5 feet in pond inspection. Water noted - pond 1/4 full in inspection report.
1997	January 30 February 13 March 18 September 25 October 29 November 12 December 29	Water noted - inspection report. Water noted - pond 1/4 to 1/3 full in inspection report. Water noted - near dry in 4/24 and dry 5/12 inspection report. Water noted - pond 1/2 full (water from undisturbed area entered pond). Water noted - inspection report. Water noted - inspection report. Water noted - ice in pond (97 pond inspections not found).
1998	January 15 March 13  September 23 October 21 December 22	Water noted - 3 inches frozen per pond inspection. Water noted - Ice and water 0.5 ft pond inspection. Pond dry in inspection 4/29. Pond full. Pond dry in previous inspection 8/20. Water noted - 1/2 full per inspection report. Water noted - frozen per inspection report.
1999	February 24 March 23 April 27 August 26 October 10	Water noted partially full thin ice. Water noted partially full - not frozen. Pond drying out. Pond dry 6/25. Water noted - Pond estimated to be 1/2 full. Pond dry 7/16. Pond 1/3 full according to pond inspection.

### Water quality standards and effluent limitations

The following R645-301 regulations applies to water quality standards and effluent limitations:

Lands to be released shall not contribute suspended solids or runoff outside the permit area in excess of the requirements set by UCA 40-10-17(j).

For which the applicable rule states:

*(j) Minimize the disturbances to the prevailing hydrologic balance at the mine site and associated offsite areas and to the quality and quantity of water in surface and groundwater systems both during and after surface coal mining operations by:*

*(I) Avoiding acid or toxic mine drainage.*

*(ii)(A) Conducting surface coal mining operations so as to prevent to the extent possible using the best technology currently available, additional contributions of suspended solids to stream -flow or runoff outside the permit are, but in no event shall contributions be in excess of requirements set by applicable state or federal law:*

#### *Acid and Toxic Drainage*

The July 1995 permit amendment provides analysis of substitute topsoil materials at the site and suggests that after mixing, through erosion processes, the site will not produce acid and toxic forming material. The site does contain boron and selenium levels which are above the standards presented in the guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, State of Utah Department of Oil Gas and Mining, April 1988, by James Leatherwood and Dan Duce. See discussions under **Topsoil and Subsoil** in this Bond Release analysis.

#### *Additional Contributions of Suspended Solids*

Reclamation at the J. B. King Mine was conducted in 1985-86 and this site is one of the first sites reclaimed in Utah under the SMCRA program. Regrading at the site was completed by placing the fill against the high wall with a convex land form. The deepest fill is located in areas where adjacent undisturbed lands with high runoff rates transport water through the site. Climatic changes impose periods of drought and high intensity short duration thunderstorms on this site. Unfortunately, this results in a land-form and environment predisposed to erosion, especially along the drainages.

The erosion from the reclaimed area is primarily retained on site. The sedimentation pond captures the sediment and is not known to have discharged during the reclamation period; therefore, the requirements to minimize additional contributions of suspended solids to stream-flow, or runoff, outside the permit area is met at this site. In addition, Rock mulch and biosolids were added to the refuse pile to decrease erosion in 1995. This activity has increased vegetation success and uses best technology currently available to reduce onsite erosion.

The applicant submitted and compared annual sediment volumes deposited in the pond with the sheet and rill erosion rates estimated using RUSLE. The sediment deposition in the pond doubled beyond the average annual estimated sediment deposition for 1997 and 1998. The increased sediment volume was attributed to high intensity storms.

An Erosion Monitoring Program was set up for the reclaimed J.B. King Mine in 1995 to monitor erosion for bond release purposes. Information was collected on-site and off-site along erosion monitoring transects and precipitation was recorded with an on-site recording rain gauge. The response to precipitation events and recovery from erosive events at the reclaimed site was proposed to be used to determine whether the erosive rate at the site is acceptable for the post mining land use.

A photographic record was also obtained on the site for each transect. Data was collected twice for the first two years after installation. The applicant installed a recording rain gauge and collected data precipitation data. The rain gauge was provided to determine the rill and gully erosion rate changes influenced from the intensity and duration of precipitation events. The applicant has provided the information, but not a summary of this data.

#### *Surface Water*

The Division assessed results from the sample collected on November 11, 1999 and compared the analysis with the state standards and the standards for use which are presented in Appendix A. The following paragraph summarizes the results.

All parameters were within the limits set by the state. Selenium was re-analyzed because the initial analysis did not provide the minimum detection limit of 0.05; the state's selenium standard for Class 4 water. Field conductivity was 1470 (umhos/cm) and the Total Dissolved Solids (TDS) identified from the Lab analysis was 853 mg/l which equates to between 1551 to 1218 umhos/cm using the standard TDS to Electrical Conductivity. ratio (0.55 to 0.7).

The sample was obtained on November 11, 1999 approximately a month after a precipitation event, recorded to be 0.15 inches on September 25, and followed by a trace of precipitation on October 12 (obtained from the JB King weather station data). An earlier sample obtained by the Division on October 10, 1999 resulted in a pH of 8 and an E.C. of 1270 umhos/cm. The ions in solution seem unusually low for a closed basin in a semi-desert setting. However, the cold temperatures during sample periods can influence the water quality. Because this site contains gypsum, sulfate is probably present in the pond water. Sodium sulfate is strongly influenced by temperature and the cool temperatures can result in mirabilite precipitate. Following freezing or reduced temperatures, it is likely that mineral precipitation reduces the ions in solution.

Large ungulate and cattle use is predominate from November through March when average minimum temperatures range from 10.2 to 17.0 ° C and average maximum temperatures range from 35.9 to 40.8 ° C (data from Emery 15 SW, Utah, Station No. 422488, period of record 7/79-6/86). Because the period of use occurs during colder temperatures the water quality should be similar to the sample obtained by the Division; although, the TDS and ions in solution may increase considerably under warmer temperatures.

### *Ground Water*

No groundwater monitoring was conducted at the site for reclamation purposes. Information selected from the Cumulative Hydrologic Impact Assessment (CHIA), dated August 9, 1985, describes ground water at the site as follows:

- 1) "The only identifiable ground-water resource within the Cumulative Impact Area (CIA) is the aquifer located approximately 200 feet below the Ferron "T" coal seam. Mining did not intercept sufficient water to warrant discharge, and exploration drilling did not encounter subsurface water. A natural system of recharge from the surface above the workings is not thought to be in existence. Accordingly, a mining induced de-watering impact is determined to have a low probability."
- 2) "Subsidence related to mining has the greatest potential for impacting groundwater resources in the CIA."
- 3) "The [subsidence] surface tension fractures may readily divert surface runoff into the subsurface and thereby increase the natural system of recharge. However, this potential impact is considered temporary since the operator has committed to sealing all open tension fractures prior to bond release."

Although the applicant was not successful in eliminating subsidence cracks, it is unlikely that significant impacts to ground water and surface water has or will occur. The reason it is unlikely that significant impacts to ground water and surface water has or will occur are based on information in the CHIA and site observations as follows:

- The average annual rainfall rate is 12 inches (1985 CHIA, J.B. King Mine).
- Visual signs of subsidence have not indicated large volumes of water flow to the cracks (see last page of photos in the December 1, 1999 bond release inspection report).
- The mine elevation is approximately 200 feet above the nearest aquifer according to the CHIA.
- No springs occur within the CIA, and no water rights were noted as having a potential to be impacted in the CHIA document.



Based on the available information, pollution of surface and subsurface water is not expected to occur, and the probability of future occurrence is not expected to vary greatly from the natural undisturbed area.

### **Hydrologic Findings for Phase II Bond Release**

The application meets the minimum hydrologic requirements in accordance with the R645 requirements for Phase II bond release with one condition. Under rule R645-301-761, the Division requires that the north perimeter ditch, (and a nearby silt fence) which routes to the sedimentation pond, needs to be removed, regraded, roughened, and seeded before receiving bond release. Based on WSMC's commitment, approval for Phase II bond release can be granted.

Based on all prior bond release findings in this document for Phase II Bond Release, the Division finds that Western States Minerals Corporation has met the minimum regulatory requirements for approval of the Phase II bond release for the J.B. King Mine. It is recommended that Phase II bond release be conditionally approved. Prior to final Phase II approval, Western States Minerals Corporation must 1) remove the north perimeter ditch and revegetate and mulch to approval on the ground by the division , 2) remove the miscellaneous scrap metal on site, 3) remove silt fences on site, 4) remove the perimeter fence, and 5) remove the sign. The fence and sign will be taken down at this time since simultaneous Phase II and Phase III release is the intent of this bond release decision document.

### **FINDINGS FOR PHASE II BOND RELEASE**

Based on all prior bond release findings in this document for Phase II Bond Release, the Division finds that Western States Minerals Corporation has met the minimum regulatory requirements for approval of the Phase II bond release for the J.B. King Mine.

It is recommended that Phase II bond release be conditionally approved. Prior to final Phase II bond release approval, Western States Minerals Corporation must 1) remove the north perimeter ditch and revegetate and mulch to approval on the ground by the division , 2) remove the miscellaneous scrap metal on site, 3) remove silt fences on site, 4) remove the perimeter fence, and 5) remove the sign. The fence and sign will be taken down at this time since simultaneous Phase II and Phase III release is the intent of this bond release decision document.

## **Analysis and Findings for Phase III Bond Release**

### **Administrative Analysis for Phase III Bond Release**

Regulatory Reference: R645-301-880 - 880.330

The application for Phase II and Phase III bond release for the J.B. King Mine was made on June 3, 1999 and the Division accepted application for Phase II only by letter dated July 6, 1999. Phase III bond release was not accepted because there was no vegetation information in the June 3, 1999 application. However, the vegetation was sampled on July 27, 1999 and data was submitted on September 28, 1999. Phase II and III notification were published in the Emery County Progress on September 7, 14, 21, and 28 1999. The comment period ended and there were no comments.

Letters were sent to the landowners ( SITLA and BLM) by WSMC advising them of this bond release action. Others on the mailing list included: Emery County Planning, OSM, BLM - Price Field Office, Water Rights, DWR, Price Water Improvement District, Emery Water Conservancy District, Southeastern Utah Association of Governments, and Department of Environmental Quality. Invitations to the bond release inspection on December 1, 1999 were sent by the Division on November 17, 1999.

In attendance at the December 1, 1999 bond release inspection were:

Division:	Bob Davidson, Wayne Western, Susan White, Sharon Falvey, Mary Ann Wright, and Pamela Grubaugh-Littig.
Western States	
Minerals Corporation:	Al Cerny, Buzz Gerick, and Jim Ashton
Emery County Planning:	Val Payne

The entire reclaimed area was observed during this inspection. At the start of the inspection, it was noted that the fence was down the day before and had been put back up by WSMC. A salt lick was inside the fence and fresh cow manure on the site. Buzz Gerick called Pamela Grubaugh-Littig on November 30, 1999 about this situation and she communicated this situation to Tom Faddies at SITLA. A letter was sent to the suspected grazer explaining the importance of keeping cattle off the site in December 1999.

The reclaimed channels that had been constructed three times were (and are) working. The portals that had been sealed 14 years ago are not easily visible but the general location was pointed out. The vegetation test plots that were reclaimed in 1994 were also observed. This area

has ample vegetation. The coal refuse pile that had biosolids and rock mulch added were also viewed. The reclaimed pile has nice micro environments with a good stand of vegetation, considering the eight inches of annual precipitation. Small pockets of coal mine waste were exposed in places where rills and gullies formed. Old mine sites, like the J.B. King Mine, generally contain several pockets of coal mine waste, but such exposure of coal is tantamount to background coal outcrop exposure and thus the Division views this as posing little or no hazard to humans or wildlife. The amount of dirt mixed with the coal makes the concern for coal waste fires almost nil.

The grouted ditch and north perimeter ditch were also walked by the group. The north perimeter ditch will be removed as well as the silt fence. The sedimentation pond was holding water (with ice on the top) and had fresh cow tracks around it. This pond will be retained for livestock watering, as approved by SITLA, the landowner.

Minor amounts of noncoal waste were seen at the site, such as small pieces of scrap metal. The permittee committed to remove these before the bond is released. The weather station also needed to be removed from the site that was still on-site the day of the bond release inspection. (This weather station was subsequently removed by WSMC on December 1, 1999 after the inspection.)

The attendees drove to the area above the mine where subsidence cracks had been observed above where coal pillars had been pulled. The cracks were four to six inches wide and one foot to three feet deep and up to six feet long. In the past, the permittee had sealed old cracks with timbers, soil and foam. The new cracks were most likely formed by small animals burrowing into the cracks followed by soil piping or flowing into voids. The hazard is not significant as far as a safety hazard, and is similar to naturally-occurring hazards in the area.

No problems were identified during this bond release inspection. See attached memo, *Technical Site Visit for J.B. King Mine*, dated December 1, 1999.

#### **Administrative Findings for Phase III Bond Release:**

Western States Minerals Corporation has met the minimum requirements for Phase III bond release for the J.B. King Mine. See 1) application for Phase III Bond Release, 2) notification letters to landowners concerning the bond release, 3) publication of Phase III Bond release for four consecutive weeks with no resulting public comments, and 4) Phase III Bond Release inspection report.

### **Vegetation Analysis for Phase III Bond Release**

Regulatory Reference: 30 CFR Sec. 785.18, 817.111, 817.113, 817.114, 817.116; R645-301-244, -301-353, -301-354, -301-355, -301-356, -302-280, -302-281, -302-282, -302-283, -302-284.

#### **Analysis:**

##### **Standards for Success**

###### *Regulatory Requirements*

The Standards for Success for Phase III Bond Release on areas previously disturbed by mining that were not reclaimed are that the Operator will demonstrate that vegetation cover:

- ▶ is not less than 90 percent of the ground cover existing before re-disturbance, **R645-301-356.250**, using a 90 percent statistical confidence interval and methods approved in the Division's "Vegetation Information Guidelines, Appendix A, **R645-301-356.110**;
- ▶ is adequate to control erosion, **R645-301-356.250**;
- ▶ will achieve the approved post mining land use **R645-301-356.100**.

Performance Standards, **R645-301-350**, included in the success standards are that vegetative cover will:

- ▶ be diverse, effective, and permanent;
- ▶ have the same seasonal characteristics of growth as the original vegetation;
- ▶ be capable of plant succession;
- ▶ be compatible with the plant and animal species of the area; and
- ▶ meet federal and Utah noxious plant laws.

**R645-301-357** states that the vegetation parameters will equal or exceed the approved success standard during the growing seasons for the last two years of the responsibility period and in areas of less than 26 inches average annual precipitation, the period will be for not less than ten full years. The period of extended responsibility will begin after the last year of seeding, or other work, excluding husbandry practices approved by the Division.

###### *Background*

The J.B. King Mine was discontinuously mined from the 1930's to 1981. All disturbance occurred prior to 1977. The site was regraded and seeded in 1985. Repairs, mostly due to rill and gully formation, continued on the mine site for the next nine years. In 1994, the refuse pile and main ditches were redesigned and reworked. Biosolids and a rock mulch was entrained into the refuse pile soil surface and extreme surface roughening used in attempts to minimize erosion and increase vegetation establishment.

At the time of application for Phase III bond release the site has been reclaimed for 14 years. Approximately 85 percent of the site has met the minimum 10 year extended responsibility period. The repair and seeding activities on the refuse pile and associated disturbance was documented as augmentative by the Division; beginning again the period of extended responsibility. (See Memo to File from Susan White, dated June 16, 1999) The area reworked for drainage repair is not considered augmentative. The area of augmentative work is not eligible for bond release until 2004 or 19 years after initial seeding. No determination was made by the Division to separate the area requiring extended liability from the original area (R645-301-820.330). The 10 year minimum responsibility period has not been met for 15% of the site. The below table summarizes the grading and seeding activities at the mine site.

Area	Work Performed	Acreage	Percent of Disturbed Area
Entire Site	Graded, Seeded, 1985	32.8	100%
Upper Drainages	Redesigned and Reconstructed, Seeded, 1994	2.73	8.3%
Refuse Pile	Rock Mulch, Biosolids, Re-seeded, 1994	3.51	10.7%
Biosolids Staging Area, Access to Refuse Pile	Re-seeded, 1994	1.78	5.4%

#### *Analysis of Permittee's Data*

Vegetation sampling at the J.B. King mine site for Phase III bond release was conducted by Bamberg Associates in June 1998 and July 1999. The entire 32.8 acres was sampled, including areas of 1994 reseeded. The sampling included measurements for vegetation cover and shrub densities on the reclaimed site and the reference area. The results of vegetation cover sampling in 1998 and 1999 are summarized in the below table.

1998 Vegetation Study June 25 -27, 1998			1999 Vegetation Study July 27, 1999		
	Reclaimed	Reference	Reclaimed	Reference	90 % of Reference
Mean % Cover	18.4	13.1	18.7	19.8	17.8
Confidence Interval	16.5 to 20.1	12.2 to 14.0	14.8 to 22.6	18.2 to 21.4	16.3 to 19.3
Median	17.0	13.0	11.0	19.0	17.1
Standard Deviation	6.7	2.4	17.9	4.3	3.8
Variance	44.7	5.7	320.4	18.1	14.6
Minimum Value	8.0	9.0	0.0	12.0	10.8
maximum value	32.0	18.0	75.0	26.0	23.4
n	40	20	60	20	60
N(min)	22	6	175	8	8

### Cover

The vegetation cover on the reclaimed mine site (18%) in 1998 exceeds the reference area standard (13%). No statistical analysis is necessary since the cover exceeds the standard. Minimum samples size (N(min)) requirements were met during sampling in 1998. Because of some inconsistency in Division sampling and permittee sampling in 1998 (see memo dated August 5, 1999 from Susan White to Pam Grubaugh-Littig) the permittee was asked to have the Division present when sampling in 1999. (Note, however, the dates of sampling by the division, as being a month and several months past the permittee's sampling dates.)

The vegetation cover on the reclaimed mine site (18.7%) in 1999 exceeds 90 percent of the reference area standard (17.8%). The vegetation cover on the reclaimed mine site was not statistically different than the reference area vegetation cover. The permittee did not

meet the minimum sample size requirement when sampling vegetation cover on the reclaimed mine site. The large sample variance and range of values on the reclaimed mine site explain the difficulty in meeting sampling requirements. As discussed in Susan White's file memo, dated August 5, 1999, problems with this type of data is not knowing, or being able to determine, the true value of the mean. The true average (mean) cover of the site is somewhere between 14.8 and 22.6 percent vegetative cover. Values below 16.3 percent (90% of the reference area, with 90% statistical confidence) cover will not meet the success standard therefore, the possibility exists that the Division will release bond when the bond should not be released. Statically this is known as a Type II Error.

### Diversity

The bond release application only stated that the reclaimed area had greater diversity than the reference area. The application did not base this statement on data. The diversity standard in the permit (Section 784.13) is to establish 3 grass, 1 forb, and 3 shrub species with a relative cover value equaling or exceeding 1% at the time of bond release. Additionally, at least one of the grass species will be a warm season grass. The Division calculated relative cover from the permittee's data and the results are summarized below.

	<b>Permit Diversity Standard (# Species with Relative Cover ≥ 1%)</b>	<b>1998 (# Species with Relative Cover ≥ 1%)</b>	<b>1999 (# Species with Relative Cover ≥ 1%)</b>
<b>Cool Season Grass</b>	2	5	2
<b>Warm Season Grass</b>	1	1	1
<b>Forb</b>	1	0	0
<b>Shrub</b>	3	6	5

The mine permit diversity standard was met or exceeded for all categories except forbs. No non-weedy forbs were represented in either years sampling in amounts greater than a trace. Note that the dates of sampling, in the early part of summer in this desert environment, are not optimal to capture the showy life stage of forbs.

The Division looked at the total number of plant species encountered within quadrats during the permittee's sampling on the reclaimed area and on the reference area. The total number of species sampled in 1998 was 18 on the reclaimed area, and 14 on the reference area. The total number of species sampled in 1999 on the reclaimed area was 20, and 14 on the reference area.

Total Number of Species Recorded in Sample Plots

1998 Reclaimed Area	18
1998 Reference Area	14
1999 Reclaimed Area	20
1999 Reference Area	14

**Production**

The bond release application states that the reclaimed mine site has greater plant productivity as compared to the reference area. No data was presented to validate this statement. The permit commits to meeting 90% of the reference area production. No production data was taken by the permittee on the reclaimed area or the reference area. This commitment was amended, and the requirement to provide production data was removed by the permit amendment process. ACT/015/002-AM99C was approved January 25, 2000. The regulations do not require previously mined sites to meet a production standard.

**Shrub Density**

The permit standard for woody species density is 1000 stems (shrubs) per acre on 12 acres and 250 stems per acre on the remainder of the site or an overall density standard of 500 stems per acre. The regulations do not require previously mined sites to meet a shrub density standard but meeting this standard is a good demonstration of the suitability of the site for a post mining land use of wildlife. On the mine site, total shrub density was measured at 2,875 shrubs per acre in 1998 and 4,633 shrubs per acre in 1999.

Number of Shrubs Per Acre

<u>Permit Standard</u>	<u>1998 Reclaimed Area</u>	<u>1999 Reclaimed Area</u>
500	2875	4633

**Postmining Land Use**

The postmining land use for the site is wildlife habitat and livestock grazing. The bond release application states that the site's potential as animal habitat is good and the site contains



more desirable vegetation for grazing than the surrounding countryside but has been protected from cattle grazing since 1989. No data or specific information was used to substantiate this statement.

This reclaimed mine site has been inspected numerous times by a division Reclamation Biologist who observed significant wildlife use of the area. Use of the area, or evidence of use, by elk, deer, badger, coyotes, jack rabbits, cottontail rabbits, kangaroo mice, raptors, song birds, ducks, harvester ants, and lizards was noted. The retained sediment pond has enhanced the site for wildlife as noted by animal tracks surrounding the pond. Shrub density establishment averages 3700 shrubs per acre. Fourwing saltbush, the dominant shrub on site, is known to be a very palatable shrub to grazing animals.

Vegetation production information expressed in pounds of forage produced per acre is generally used to demonstrate the suitability of an area for cattle grazing. No information concerning vegetation production on the reclaimed mine site is available. The retained sediment pond will be a good water source for cattle but unless proper fencing and pasture use is used in the post mining management plan there could be a great potential for overuse of the area surrounding the pond.

### **Site Inspection**

The Phase II and III bond release inspection was conducted December 1, 1999. Cattle were trespassed into the disturbed area and a salt lick was placed adjacent to the sediment pond. Cattle trails were evident but vegetation appeared in a condition similar to the previous month's November inspection. The November, 1999 Inspection Report records that grazing by rodents, rabbits and elk was evident on the entire site.

Generally, vegetation on site looks good, although small bare areas and weedy species are present. Areas of no desirable vegetation are still present. The areas reseeded in 1994 look very good with good vegetation establishment and diversity. Erosion is present and generally greater than off site, but not detrimental to the post mining land use. Large gullies are mostly associated with areas that drain water from above the site.

The Division approved removal of the north perimeter disturbed area ditch. The ditch has not yet been removed. At other sites, the Division has required control of sediment until vegetation establishment, by visual evaluation, after removal of sedimentation structures, including ditches, prior to approving Phase III bond release. Phase III bond release is generally not recommended until vegetation has established on the reclaimed north perimeter ditch.

### **Vegetation Findings for Phase III Bond Release:**

Information provided in the bond release application meets the minimum regulatory requirements for Phase III bond release. Data from vegetation sampling also meets or exceeds the minimum cover, diversity, shrub density and post mining land use regulatory and permit requirements for Phase III for the entire site.

The site has been in a reclaimed status for 15 years. Parts of the site have had some augmentative practices applied to enhance vegetation succession. This work was highly successful. However, 15% of this 32.8 acre site does not meet the entire 10 year extended responsibility period. Thus, 5.29 acres should technically be excised for bond release until 2004. The division has reviewed this situation with great care and finds that from 1) analyzing the results of the vegetation sampling which were done over the entire site, and 2) by visual evaluation of the entire site, that the 5.29 acres, in the middle of the 32.8 acre reclaimed area, is functioning ecologically as well, or better than, its surrounding 27 acres. The division finds that this meets the intent of the Act to "establish... a diverse and permanent vegetative cover, capable of self-regeneration and plant succession and at least equal in extent of cover to the natural vegetation of the area. Thus, Phase III bond release will be granted for the entire site based on vegetational analyses which shows the site meets and in some cases exceeds standards set by the approved reference area.

Prior to Phase III bond release, the permittee shall remove the north perimeter ditch and seed and mulch the ditch to the division's satisfaction on the ground.

### **Hydrologic Analysis for Phase III Bond Release**

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-880.320.

#### **Analysis:**

##### **Drainages**

The applicant did not provide any current on-site analyses for the permanent drainages or the Sedimentation Pond configuration. To determine whether the applicant meets the terms and conditions in the plan, the ditch designs for the plan were reviewed. The design approved for the ditches allows for a meander limit 50 ft. on either side of the centerline. None of the ditches were visually noted to have widened beyond the 50 ft. centerline meander limit. The projected stable limits for the drainage in the approved plan show the channel can down cut approximately 40 feet. Greater than a 40 foot drop in the channel bed elevation was not visually noted during the field inspection (see photo pages 3 and 4 in the December 1,1999 bond release inspection report). The requirements for ditches is met.

### **Sedimentation Pond**

Under Phase III bond release the design standards for the permanent impoundment must be met. The applicant did not provide a certified analyses that the current pond configuration and design standards are met by the current Sedimentation Pond. The Division is considering the annual quarterly report conducted on October 10, 1999 for the fourth quarter, and the annual certification provided on December 11, 1998, as the applicant's demonstration that the pond meets design standards. This requirement is met.

### **Water Rights**

The capped well at the mine site was transferred to SITLA, Water Right 94-295 and 94-316, on December 12, 1985. They now have the responsibility for well abandonment.

The sediment pond, it was stated by Mr. Gerick in a December 18, 1995 memo to the Division of Water Rights, has no beneficial or planned use. According to the letter from the Division of Water Rights, no water right is required because no beneficial use was associated with the right. Under most circumstances, the state has treated stock watering as a beneficial use which requires a water right. SITLA will be responsible for complying with Water Rights law requirements upon bond release. A letter dated February 23, 2000 from the division, notified SITLA of this well and water right responsibility. This requirement is met.

### **Water quality standards and effluent limitations.**

Findings made in the Phase II bond release related to water quality and effluent standards apply to Phase III bond release. Water Quality standards have been met for Phase III.

### **Hydrologic Findings for Phase III Bond Release:**

The Permittee met the minimum requirements of this section.

### **Stability/Subsidence/Roads Analysis for Phase III Bond Release**

#### **AOC Analysis:**

The requirements for (AOC) approximate original contours are that the reclaimed topography blends into the surrounding area and that reclaimed drainage patterns complement the off site patterns. The Permittee met the AOC requirements by having the site graded to blend into the existing topography and have drainage patterns complement those in the surrounding

areas. The edges of the reclaimed area were feathered into the surrounding area so no jumps occur in the topography.

### **Backfilling and Grading/Subsidence Analysis:**

The backfilling and grading requirements have been met. The slopes are stable and meet the required safety factor and AOC requirements. All coal and coal mine waste has been properly disposed of by being covered with 4 feet of material. Some coal material was exposed by erosion. The amount of exposed coal was small and the Division does not consider the material to be a hazard to humans or the environment.

The area was monitored for subsidence from 1985 to 1997. Subsidence monitoring ceased because surface movement could no longer be detected. After subsidence monitoring ceased, surface cracks appeared above the area where full extraction mining occurred. The following is a chronology of the surface subsidence monitoring program.

- MRP UMC 784.20 - The Permittee states that no existing or planned structures occur in the subsidence zone. In the permit boundaries no aquifers or recharge areas are above the coal. The only renewable resource in the subsidence zone is grazing.

Drill hole data and on site inspection show that no aquifers exist between the surface and the I seam. The depth from the surface to the I seam is 120 feet.

A 75 ft. barrier pillar will be maintained around the permit boundary to prevent subsidence from occurring outside the permit area. A 100 ft. barrier pillar will be maintained around the coal outcrop of the I seam.

The Permittee calculated that the surface would drop between 5 ft. to 8 ft. The most likely amount of subsidence is 7 ft.

- Amendment approved June 28, 1985 (UMC 817.124) - Surface subsidence took place above the mined-out areas. Tension cracks formed in the subsidence zone. To date the ground subsided 7 feet. Comparisons between the observed and the predicted subsidence amount show that most of the expected subsidence has occurred. Surface damage is limited to surface cracks which self heal after 3 years.

- Annual report 1996 - The Division reviewed the subsidence monitoring data for the 1996 annual report. The Division found that no significant surface movement or damage had occurred since 1983.
- April 28, 1997 - The Permittee submitted an application to cease subsidence monitoring.
- May 1997 - The Division approved and incorporated an amendment to cease subsidence monitoring at the J.B. King Mine. The Division and the Permittee analyzed the subsidence data and concluded that significant surface movement and damage had not occurred since 1984. Minor amounts of subsidence were noticed between 1988 and 1990 after a 5.0 magnitude earthquake occurred in the area in July 1988.

The Division and the Permittee continued to monitor subsidence until 1997. The Division and the Permittee concluded that the area has stabilized and that no material damage or impacts to groundwater had occurred. The groundwater table is approximately 335 ft. below the ground surface. Based on the depth to groundwater and the surface drainage no detrimental impacts to the groundwater are expected.

- August 20, 1998 - From inspection report "Walked through the subsidence area on top and observed several subsidence cracks. Most of the cracks are along the northern and eastern edges of the subsidence area. With recent rains some cracks have been exposed and are more prominent from past observations. The rains have washed sand into the cracks and have exposed the edges of sandstone slabs that have separated during subsidence. The cracks in the sandstone range in width from 3 to 4 inches, are up to several feet long, and are sometimes many feet deep."
- May 22, 1998 - From inspection report "Walked through the subsidence area on top and observed several subsidence cracks."
- September 23, 1998 - From inspection report "The subsidence cracks have worsened considerably since the last inspection, especially the north-south trending cracks along the eastern edge of the subsidence area. Sand and soil continues to erode down into the cracks furthering the exposure. Some cracks are now several tens of feet long. Personal injury to an unwary person or animal is a possibility. The cracks need to be repaired and filled accordingly. The possibility of injecting foam down into the crack was discussed with Buzz Gerick on August 8, 1998."

- October 21, 1998 - From inspection report "Walked through the subsidence area on top and observed several subsidence cracks."
- June 25, 1999 - From the inspection report "Three subsidence fist-size holes have re-formed in the upper subsidence area. All other cracks and holes have healed over nicely."
- September 28, 1999 - From the inspection report "The subsidence fist-sized holes that re-formed this summer in the upper subsidence area have not increased in size. There are not additional signs of other cracks and holes."
- November 18, 1999 - There are pictures of the holes. The holes are 6 inches in diameter and have not grown since the last inspection. It is not believed that the holes or cracks are significant hazards and that bond release should proceed.

The Division does not know why cracks are forming. The Division analyzed the data from the subsidence monitoring program and determined that subsidence had been completed in the full extraction areas. Possible reasons for the cracks are: 1) piping caused by existing fractures or, 2) areas where coal was partially extracted are subsiding. Since subsidence monitoring ceased in 1997, the Division has no way of determining if cracks are caused by new subsidence.

The Division does not bond for potential subsidence damage. However, the Division does require a Permittee to post bond for any subsidence damage to land, structures, facilities or to water supplies protected under R645-301-731.530 not repaired within 90 days unless an extension is granted (R645-301-525.550). The Division found that water supplies, structures or facilities do not exist in the permit area. The only potential subsidence item that the Division could require the Permittee to bond for is to repair subsidence cracks.

Surface cracks may continue to form at the site. The cracks may not (and do not) prevent the post mining land use, grazing, from being implemented. The landowner (State Institutional Trusts Lands) has not found the cracks to pose a hazard to humans or animals to date. Surface cracks usually self heal in a few years. The Division can reasonably assume that the surface cracks in the permit area will eventually self heal. The landowner has not requested that the surface cracks be repaired, therefore, the Division will take further action and proceed with bond release.

**Roads Analysis:**

All roads in the permit area have either been reclaimed or were retained as part of the post mining land use. The roads in the permit area are stable and control erosion.

**Stability/Subsidence/Roads Findings for Phase III Bond Release:**

The Permittee met the minimum requirements for Phase III bond release.

**FINDINGS FOR PHASE III BOND RELEASE**

Based on all prior bond release findings in this decision document for Phase III bond release, the Division finds that WSMC has met the minimum regulatory requirement for approval of Phase III bond release for the J.B. King Mine. Upon 1) removal of the north perimeter ditch and seeding and mulching, 2) removal of the miscellaneous scrap metal on site, 3) removal of the silt fences on site, 4) removal of the perimeter fence, and 5) removal of the sign and, upon Division approval of the on-the-ground work, Phase II will be granted. Phase III will then be granted simultaneously with Phase II bond release.

**CONCLUSORY FINDINGS for PHASE II AND PHASE III BOND RELEASE**

**FINDINGS FOR PHASE II BOND RELEASE**

Based on all prior bond release findings in this document for Phase II Bond Release, the Division finds that Western States Minerals Corporation has met the minimum regulatory requirements for approval of the Phase II bond release for the J.B. King Mine.

It is recommended that Phase II bond release be conditionally approved. Prior to final Phase II approval, Western States Minerals Corporation must 1) remove the north perimeter ditch and revegetate and mulch to approval on the ground by the division, 2) remove the miscellaneous scrap metal on site, 3) remove silt fences on site, 4) remove the perimeter fence, and 5) remove the sign. The fence and sign will be taken down at this time since simultaneous Phase II and Phase III release is the intent of this bond release approval document.

Phase II and Phase III Bond Release

J.B. King Mine

February 28, 2000

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### **FINDINGS FOR PHASE III BOND RELEASE**

Based on all prior bond release findings in this decision document for Phase III bond release, the Division finds that WSMC has met the minimum regulatory requirement for approval of Phase III bond release for the J.B. King Mine. Upon 1) removal of the north perimeter ditch and seeding and mulching, 2) removal of the miscellaneous scrap metal on site, 3) removal of the silt fences on site, 4) removal of the perimeter fence, and 5) removal of the sign and, upon Division approval of the on-the-ground work, Phase II will be granted. Phase III will then be granted simultaneously with Phase II bond release.

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## Appendix A: State Water Quality Criteria and Livestock Toxicity

## APPENDIX A

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**NUMERIC CRITERIA FOR CLASS 4 WATERS DOMESTIC, RECREATION, AND AGRICULTURAL USES**


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PARAMETER	CRITERIA	SAMPLE 11/10/99	
PHYSICAL			
pH (RANGE)	6.5-9.0	Lab	8.97
		Field	8.96
BACTERIOLOGICAL			
(30-DAY GEOMETRIC MEAN) (NO.)/100 ML) (7)			
Max. Total Coliforms **	5000	Not analyzed	
Max. Fecal Coliforms**	200	Not analyzed	
METALS (DISSOLVED, MAXIMUM MG/L) (2)			
Arsenic	0.1	<	0.03
Cadmium	0.01	<	0.002
Chromium	0.10	<	0.01
Copper	0.20	<	0.005
Lead	0.1	<	0.03
Selenium	0.05		0.014
IN ORGANICS (MAXIMUM MG/L)			
Boron *	0.75	<	0.3
Total Dissolved Solids (4)	1200	Lab	853
Electric Conductivity		Field	1,4700 (umhos/cm)
Nitrate *** (included based on recommended MCLs for livestock)			
100 mg/l of nitrate-nitrogen plus nitrite-nitrogen		nitrate-nitrogen	< 0.04
		nitrite-nitrogen	0.42

## FOOTNOTES:

\* Although Boron is a state water quality standard the post mining land use of grazing and wildlife would not be impacted by increased levels in this parameter. (High nitrates interfere with the analysis and should be obtained in conjunction with Boron analysis if high nitrates are suspected to be present).

\*\* Although this is a state standard for Class 4 waters it is primarily applicable to irrigation water used on crops for human consumption.

(2) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by atomic absorption or inductively coupled plasma (ICP) spectrophotometry.

(4) Total dissolved solids (TDS) limits may be adjusted if such adjustment does not impair the designated beneficial use of the receiving water.

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APPENDIX A

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(7) Exceedence of bacteriological numeric criteria from nonhuman nonpoint.

\*\*\* Not a state standard for class 4 water.

The following information was collected at various Internet sites to determine potential for Toxicity to Livestock. Because wildlife toxicity information will require additional time to obtain the livestock levels will be used as cursory information to get a general idea of acceptable levels for the postfixing land use.

**Salinity levels for different classes of livestock are:**

Low	Less than 1000 milligrams per liter (mg/l). Excellent for all classes of livestock. (Less than 1500 umhos/cm specific conductance- Montana State University).
Very Satisfactory	1000-2999 mg/l. All classes of livestock. Temporary, mild diarrhea in livestock may be noticed in animals not accustomed to this level of salinity. (1500-5000 umhos/cm specific conductance- Montana State University).
Satisfactory	3000-4999 mg/l. Satisfactory for livestock; Livestock not used to saline water may refuse it or have temporary diarrhea. 5000 - 8000 umhos/cm specific conductance. Montana State University.
Marginal	5000-6999 mg/l. Marginal for beef cattle, sheep, and horses; should not be used for pregnant or lactating animals. (8000- 11000 umhos/cm specific conductance).
Considerable Risk	7000-10,000 mg/l. Considerable risk for pregnant or lactating cows, horses, sheep, or immature animals of any class. Avoid use for all animals if possible; however, older animals may subsist on water of this quality under certain conditions.(11000-16000 umhos/cm specific conductance.

**Elements and Compounds**

Note: Maximum Contaminant Level (MCL), in mg/l, indicates the uppermost limit at which water should be considered safe to use. (This is probably considered to apply for a specified time period and may be considered the major water source but, this needs to be researched further).

Selenium	MCL 0.05 mg/l	Too much selenium can cause "blind staggers" or "bob-tailed disease," leading to loss of mane and tail in horses, switch of cattle. Animals may recover if removed quickly from the contaminated source
Fluoride	No MCL	A limit of 2.0 mg/l is recommended. Fluoride interacts with

APPENDIX A

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		copper in dietary minerals. Excessive levels can cause loss of tooth enamel, resulting in rapid, uneven wear. Secondary effects disturb metabolism, causing semi-starvation conditions.
Arsenic	MCL 0.02 mg/l.	Arsenic is stored by the body and can reach chronic toxicity levels, causing death.
Copper	MCL 0.5 mg/l.	In combination with phosphorus, copper plays a role in bone development. Ruminants are more susceptible to copper toxicity. Problems can occur when dietary molybdenum is either excessive or deficient.
Nitrate	No MCL	High nitrate levels may indicate high levels of biological pathogens (bacteria that can cause gastrointestinal disease). Recommended MCLs are 100 mg/l of nitrate-nitrogen plus nitrite-nitrogen, or 10 mg/l of nitrite-nitrogen alone. Excessive nitrate/nitrite intake can lead to problems in fetal development.
Cadmium	MCL 0.05 mg/l	Cadmium is considered very toxic. In young animals, increased dietary intake of cadmium can cause anemia. Reproductive problems related to cadmium have been observed in most livestock classes.
Boron	MCL 5.0 mg/l	Little scientific information on livestock boron intake is available. Slower growth rate is known to be one of the effects of too much boron in livestock water. Higher levels (150-300 ppm) can cause inflammation and edema in the legs of cattle, causing subsequent weight loss.
Chromium	MCL 1.0 mg/l	Carbohydrate metabolism in animals requires dietary chromium. Chromium toxicity from diet has been studied very little and is not considered a serious problem. Symptoms of elevated chromium intake varies among classes of animals, but primarily appear as skin and soft tissue problems.
Lead	MCL 0.1 mg/l	Pregnant goats will abort fetuses as a result of moderate levels of lead intake.
Mercury	MCL 0.01 mg/l	Mercury is not essential to animal nutrition and is not readily absorbed. Mercury can cause acute poisoning, much the same as arsenic. In cattle and sheep, dietary intake of 0.2 mg/kg mercury will cause un-coordination, unsteady gait, and eventual death.
Zinc	MCL 25 mg/l	Required for normal growth and development of all animals: 40-100 ppm zinc in the diet are normal.

APPENDIX B

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1. Water Rights  
Letter from WMSC to Casey Ford, dated 12/18/95  
Letter from Casey Ford to WSMC, dated 01/05/96  
Letter to SITLA from DOGM, dated 2/23/00
2. Post Mining Land Use  
Letter from WSMC to State Lands, dated 8/17/94  
Letter from State Lands to WSMC, dated 9/14/94  
Letter from SITLA to DOGM, dated 10/22/99  
Letter to Brad Johnson from DOGM, dated 01/04/00
3. Earth Day Award, dated 1998
4. Letters from WSMC to Interested Parties, dated 9/15/99  
Price River Water Improvement District  
SITLA  
Water Rights  
Wildlife Resources  
Bureau of Land Management, Price Field Office  
Environmental Quality  
Emery County Planning  
Southeastern Association of Governments  
Emery County Conservancy District
5. Affidavit of Publication Notice, Emery County Progress, September 7, 14, 21, & 28, 1999
6. Bond Release Site Inspection, December 1, 1999
7. "K" Factor Analysis, May 27, 1999
8. Phase III Bond Release Vegetation Memo, dated December 13, 1999
9. J.B. King Mine Chronology
10. Paper Entitled "Coal Refuse Weathering Under Cold Desert Conditions"

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P. 01

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